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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/544,156	Applicant(s) KOJIMA ET AL.	
	Examiner Christopher Crutchfield	Art Unit 2419	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 27 February 2009.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-19 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 6, 7, 9, 10, 12, 13 and 15** are rejected under 35 U.S.C. 102(b) as being clearly anticipated by *Rosen*, et al. (Rosen, Viswanathan and Callon, Multiprotocol Label Switching Architecture, Internet Engineering Task Force, July 2000).

Regarding claim 6, *Rosen* discloses a cutting-through method (Page 20- See (a), infra) for direct communication by a plurality of edge routers for connecting a core network and a plurality of external IP networks mutually at border points of the core network and the external IP networks, (Pages 4-6) comprising:

a. Maintaining lists, in which ingress-side IP address correspond to identifiers for showing outgoing interfaces of egress edge routers, in ingress edge routers (Pages 4-6 and Page 20). (The network of *Rosen* discloses an Ingress Edger router which maps IP addresses (i.e. FEC's) to specific label switched paths, which serve to identify the outgoing egress label router of the MPLS network [Pages 4-6]. Such mapping is done by means of a routing table, which matches IP address ranges [i.e. FEC's] to label switched paths [Page 5]. The paths are then routed through the MPLS network to a corresponding

egress edger router connected to another IP domain, where the label is removed and the packet forwarded using its IP address [Pages 4-6]. In addition to this standard MPLS routing, *Rosen* discloses the use of penultimate hop popping where the next to last router in the label switched path removes the label so that the final egress label switched router does not need to process the label. *Rosen* further discloses a special form of penultimate hop popping where the final router in the label switched path is not even a MPLS label switched router, but is rather a standard IP router. In this scenario, at the last MPLS router in the chain [i.e. the edge router, as it is at the edge of the MPLS network and the beginning of the IP network] uses the label to determine the appropriate output port upon which to send the packet and then strips off the label entirely [Page 20]. The net result of such an act is that the label switched path (LSP) designates the output port of the egress label switch router, creating a cut-through path. Therefore since the LSP designates the output port of the egress label switch router, and the LSP is associated with the corresponding ingress side IP addresses, the ingress side IP addresses correspond to identifiers for showing outgoing interfaces of egress edge router, and are stored in the ingress edge router.)

b. Adding the identifiers corresponding to the ingress-side IP address to the IP packets by the ingress edge routers when IP packets are transmitted (Pages 4-6 and 20). (The label for the LSP is added at the ingress edge router - See also (a), Supra).

c. Transmitting the IP packets to the outgoing interfaces by referring to the identifiers added to the IP packets in the egress edge routers (Pages 4-6 and 20 - See (a), Supra).

Regarding claim 7, *Rosen* discloses a cutting-through method according to claim 6 wherein MPLS labels are used for the identifiers (Pages 4-6 and 20, See Claim 6, Supra).

Regarding claim 9, *Rosen* discloses an edge router comprising inputting sections for connecting a core network and a plurality of external IP networks at border points mutually and handling incoming IP packets, inputted from the external IP networks, to the core network and outputting sections for handling outgoing IP packets outputted from the core network to the external IP networks, (Pages 4-6 and 20) wherein the inputting sections has:

a. A section for maintaining lists, in which ingress-side IP addresses correspond to identifiers for showing outgoing interfaces of other egress edge routers (Pages 4-6 and Page 20). (The network of *Rosen* discloses an Ingress Edger router which maps IP addresses (i.e. FEC's) to specific label switched paths, which serve to identify the outgoing egress label router of the MPLS network [Pages 4-6]. Such mapping is done by means of a routing table, which matches IP address ranges [i.e. FEC's] to label switched paths [Page 5]. The paths are then routed through the MPLS network to a corresponding egress edger router connected to another IP domain, where the label is removed and the packet forwarded using its IP address [Pages 4-6]. In addition to this standard MPLS routing, *Rosen* discloses the use of penultimate hop popping where the next to last router in the label switched path removes the label so that the final egress label switched router does not need to process the label. *Rosen* further discloses a special form of penultimate hop popping where the final router in the label switched path is not even a MPLS label switched router, but is rather a standard IP router. In this scenario, at the last MPLS router in the chain [i.e. the edge router, as it is at the edge of the MPLS network and the beginning of the IP network] uses the label to determine the appropriate

output port upon which to send the packet and then strips off the label entirely [Page 20]. The net result of such an act is that the label switched path (LSP) designates the output port of the egress label switch router, creating a cut-through path. Therefore since the LSP designates the output port of the egress label switch router, and the LSP is associated with the corresponding ingress side IP addresses, the ingress side IP addresses correspond to identifiers for showing outgoing interfaces of egress edge router, and are stored in the ingress edge router.)

b. A section for adding the identifiers corresponding to the ingress-side IP addresses of the IP packets to the IP packets, in accordance with the lists when the IP packets are transmitted to other edge routers, and the outputting section has a section for referring to the identifiers and transmitting the IP packets to the outgoing interfaces, indicated by the identifiers (Pages 4-6 and page 20 – See (a), Supra).

Regarding claim 10, *Rosen* discloses an edge router wherein MPLS labels are used for the identifiers (Pages 4-6 and page 20 – See claim 9, Supra).

Regarding claim 12, *Rosen* discloses a program, installed to an information processing apparatus, (It is inherent that the routers of *Rosen* included processors) for realizing functions corresponding to edge routers, the functions being inputting functions, for connecting a core network and a plurality of external IP networks at border points mutually and handling incoming IP packets inputted from the external IP networks to the core network and outputting functions, for handling outgoing IP packets outputted from the core network to the external IP networks, wherein, the inputting functions serve for (Pages 4-6 and 20):

a. A function for maintaining lists in which ingress-side IP addresses correspond to identifiers for showing outgoing interfaces of other egress edge routers. (Pages 4-6 and Page 20). (The network of *Rosen* discloses an Ingress Edger router which maps IP addresses (i.e. FEC's) to specific label switched paths, which serve to identify the outgoing egress label router of the MPLS network [Pages 4-6]. Such mapping is done by means of a routing table, which matches IP address ranges [i.e. FEC's] to label switched paths [Page 5]. The paths are then routed through the MPLS network to a corresponding egress edger router connected to another IP domain, where the label is removed and the packet forwarded using its IP address [Pages 4-6]. In addition to this standard MPLS routing, *Rosen* discloses the use of penultimate hop popping where the next to last router in the label switched path removes the label so that the final egress label switched router does not need to process the label. *Rosen* further discloses a special form of penultimate hop popping where the final router in the label switched path is not even a MPLS label switched router, but is rather a standard IP router. In this scenario, at the last MPLS router in the chain [i.e. the edge router, as it is at the edge of the MPLS network and the beginning of the IP network] uses the label to determine the appropriate output port upon which to send the packet and then strips off the label entirely [Page 20]. The net result of such an act is that the label switched path (LSP) designates the output port of the egress label switch router, creating a cut-through path. Therefore since the LSP designates the output port of the egress label switch router, and the LSP is associated with the corresponding ingress side IP addresses, the ingress side IP addresses correspond to identifiers for showing outgoing interfaces of egress edge router, and are stored in the ingress edge router.)

b. A function for adding the identifiers corresponding to the ingress-side IP addresses of the IP packets to the IP packets in accordance with the lists when the IP packets are transmitted to other edge routers, and the outputting function serves for referring to the identifiers and transmitting the IP packets, indicated by the identifiers, to the outgoing interfaces (Pages 4-6 and page 20 – See (a), Supra).

Regarding claim 13, *Rosen* discloses a program according wherein MPLS labels are used for the identifiers (Pages 4-6 and page 20 – See claim 12, Supra).

Regarding claim 15, *Rosen* discloses a recording medium, readable by the information processing apparatus, on which the program according is recorded (It is inherent that the edge router of *Rosen* uses a processor. It is further inherent that the processor contains memory, upon which instructions are executed.)

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. **Claims 1-3 and 16-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over X*u*, et al. (Xu, Basu and Xue, IETF Draft, June 2002, A BGP/GMPLS Solution for Inter-Domain Optical Networking) in view of *Rajagoplan* (Rajagoplan, Liciani, Aduche, Cain, Jamoussi and Saha, IP over Optical Networks: A Framework – Second Draft Version, 6 June 2002, Internet Engineering Task Force, Pages 1-41).

Regarding Claim 1, X*u* discloses an optical network comprising:

a. Sections for establishing optical paths (Page 5, Figure 1, Connection between X1 and X2). (X1 and X2 are Optical Cross Connects [OXCs] and establish optical paths [Page 5, "X1, X2, X3,...are Optical Cross Connects (OXCs)]).

b. A plurality of optical edge routers (Figure 1, A2 and B2) for connecting external IP networks (Figure 1, Client B and Client A) to the optical network (See Page 4 – the Provider networks are optical GMPLS networks).

c. A plurality of optical cross connects, (Page 5, Figure 1, X1 and X2) for connecting the optical edge routers by the optical paths, (Page 5, Figure 1, Connections between X1 and Y2) having switching sections (Page 5, the Optical Cross Connects switch the paths) with respect to an optical pulse unit (It is officially noted that in an optical network, their must be an optical pulse unit to generate an optical signal, therefore the optical cross connects switch the optical paths with respect to an optical pulse unit).

d. Wherein each of the optical edge routers has an a IP network instance for maintaining a routing table in each of the external IP networks (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router [Page 5].)

e. Wherein *each optical ingress router* has an optical network control instance for maintaining topology information in the optical network (Page 9, "In provider networks, both…." to end of page) and switching/signaling the optical paths (Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9). (X1, X2, Y1 and Y2 are Optical Cross Connects [OXCs] and establish and switch optical paths connecting the edge routers [i.e. X1 and Y2] [Page 5, Figure 1, Connection between X1 and Y2 and Page 5, "X1, X2, X3,…are Optical Cross Connects (OXCs)]. Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, "In provider networks, both…." to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links

[including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

Xu fails to disclose that each of the optical edge routers have an optical network control instance for maintaining topology information in the optical network and switching/signaling the optical paths. In the same field of endeavor, *Rajagoplan* discloses that each of the optical edge routers have an optical network control instance for maintaining topology information in the optical network and switching/signaling the optical paths (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing information from the optical network and may also signal explicit routes through the network [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes.)

Therefore, since *Rajagoplan* suggests a combined IP router, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan*. The motive to combine is provided by *Rajagoplan and* to allow the IP

network to use explicit route signaling if the IP network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Regarding Claim 2, X*u* discloses an optical network wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the *optical ingress* routers to which the external IP networks are connected (Page 6). (The optical ingress routers/provider BNEs treat the corresponding BNE at the other side of an optical link as a BGP neighbor [Page 6, - X2 treats Y1 as a BGP circuit switching neighbor/peer]. The route information is then exchanged via an interior Border Gateway Protocol [Page 6].)

X*u* fails to disclose an optical network wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the edge routers to which the external IP networks are connected. In the same field of endeavor, *Rajagoplan* discloses an optical network wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the edge routers to which the external IP networks are connected (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].)

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer

edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the network should also be moved to the edge of the network along with the optical network control instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6). The motive to combine is to allow the dissemination of IP routes to other network domains.

Regarding Claim 3, X*u* discloses an optical network wherein BGPs are used for protocols for exchanging the route information of the external IP networks (Page 6). (The optical ingress routers/provider BNEs treat the corresponding BNE at the other side of an optical link as a BGP neighbor [Page 6, - X2 treats Y1 as a BGP circuit switching neighbor/peer]. The route information of the external IP networks is then exchanged via an interior Border Gateway Protocol [Page 6].)

X*u* fails to disclose an optical network wherein BGPs *initiated in the optical edge router* are used for protocols for exchanging the route information of the external IP networks. In the same field of endeavor, *Rajagoplan* discloses an optical network wherein BGPs *initiated in the optical edge router* are used for protocols for exchanging the route information of the external IP networks (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].)

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the network should also be moved to the edge of the network along with the optical network control instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6). The motive to combine is to allow the dissemination of IP routes to other network domains.

Regarding claim 16, *Xu* discloses An information transmission network system:

a. Having a plurality of line exchangers (Figure 1, X1-X4, Page 5, "...X1-X5...are optical cross connects) and a plurality of packet exchangers, for setting communication lines among the packet exchangers, (Figure 1, A2, B2, A3, A5, A7) the line exchangers and the packet exchangers being connected by communication lines, (Figure 1, Connection between A2 and X1) wherein, the line exchangers have a line switch and a section for controlling line paths and wherein the line switch has a function for connecting the communication lines, connected to the line exchangers, arbitrarily (It is officially noted

that optical cross connects contain line switches that can connect input and output ports arbitrarily).

b. Wherein each of the packet exchangers, (Figure 1, Element A2) connected to the line exchangers (Figure 1, Element X5), has a packet switch and a section for controlling packet paths and the packet switch has functions for selecting communication lines for transmission and outputting in accordance with packet-ingress-side's information transmitted via the communication lines and the section for controlling packet paths acknowledges connection-related-information with respect to packet exchange among the packet exchangers connected via the communication lines, by exchanging the information for the packet paths via the communication lines, and determines the communication lines for output in accordance with the packet-ingress-side's information (Pages 4-7). (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router via the communication lines [Page 5].)

Xu further disclose that a separate *optical ingress router* has a section for controlling line paths, (Pages 7 and 9, The ingress edge router/BNE controls the establishment of label switched paths, and therefore the line paths) and a cooperative control section (Pages 7 and 9, The IP egress edge router of the client network contacts the ingress edge router in the provider network via BGP to initiate a label switched path) wherein:

a. The section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers, receiving the messages for controlling and setting the connected lines, set up the communication lines, and sending control messages to the line exchangers for setting the lines in accordance with the instructed paths (Page 7, Point 8, The ingress BGP speaker decides the next hop BGP speaker and initiates intra domain label switch path creation).

b. The sections for controlling line paths in the *optical ingress router* are connected to at least the sections for controlling line paths in the line exchangers via lines among the packet exchangers and the line exchangers (Pages 6 and 7 - The optical ingress router/provider edge router controls the optical cross connects via the control plane and the section for controlling line paths.)

c. The sections for controlling line paths in the line exchangers and the sections for controlling line paths in the *optical ingress router* have a functions for acknowledging line connection conditions in a communication network, by exchanging information of the communication conditions among the communication lines (Page 9, "In provider networks, both…." to end of page). (Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, "In provider networks, both…." to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links [including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client

A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

c. A cooperative control section that has a function for receiving instructions regarding new communication lines, referring to two pieces of information, connection information, with respect to line-exchanging-network, collected by the *optical ingress router*, and connection information with respect to packet-exchange collected by the section for controlling packet paths. (The provider ingress edge router has an intra-domain routing process that creates the intra domain label switched path based on the interior optical network information [Page 7, Section 8] and the egress edge IP address [Page 7, Section 8]. Therefore, it is inherent that the instruction to create such a path must include the connection information of the line exchange and the packet path information.)

Xu fails to disclose each of the *packet exchangers*, connected to the line exchangers, has a section for controlling line paths, and a cooperative control section wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers, receiving the messages for controlling and setting the connected lines, set up the communication lines, and sending control messages to the line exchangers for setting the lines in accordance with the instructed paths, the sections for controlling line paths in the packet exchangers are connected to at least the sections for controlling line paths in the line exchangers via lines among the packet exchangers and the line exchangers the sections for controlling line paths in the line

exchangers and the sections for controlling line paths in the packet exchangers have a functions for acknowledging line connection conditions in a communication network, by exchanging information of the communication conditions among the communication lines and a cooperative control section that sections select paths, being used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines. In the same field of endeavor, *Rajagoplan* discloses each of the packet exchangers, connected to the line exchangers, has a section for controlling line paths, and a cooperative control section wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers, receiving the messages for controlling and setting the connected lines, set up the communication lines, and sending control messages to the line exchangers for setting the lines in accordance with the instructed paths, the sections for controlling line paths in the packet exchangers are connected to at least the sections for controlling line paths in the line exchangers via lines among the packet exchangers and the line exchangers the sections for controlling line paths in the line exchangers and the sections for controlling line paths in the packet exchangers have a functions for acknowledging line connection conditions in a communication network, by exchanging information of the communication conditions among the communication lines (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing and link state information from the optical network and may also signal explicit routes through the network via the control domain [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally it is inherent that there exists cooperative control between the IP [i.e. packet exchanger]

and MPLS [i.e. path controller] signaling to establish the routes, as the routes are established responsive to demands to access remote IP networks, but are implemented using MPLS label switch establishment commands [Page 15-20, Section 6 and Pages 13-14, Section 5.2].)

Therefore, since *Rajagoplan* suggests a combined IP router, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu*. Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* and implementing cooperative IP and MPLS control of routing, as taught in the separated packet and control units of *Xu* by means of BGP signaling (*Xu,* Page 6) and as taught by *Rajagoplan* via the combined IP/MPLS label path establishment. The motive to combine is provided by *Rajagoplan* and is to allow the IP network to use explicit route signaling if the IP network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Regarding claim 17, X*u*, does not disclose an information transmission network system for setting the communication lines among the packet exchangers and packet/line exchangers, having packet/line exchangers in which the packet exchangers and the line exchangers are integrated. However, the integration of a packet exchanger and a line exchanger was well known in the pertinent art at the time of the invention. Thus it would have been obvious to a person of ordinary skill in the pertinent art at the time of the invention to integrate the packet exchanger and the edge line exchanger of X*u*, et al. The packet exchanger (Figure 1, A2, B2, A3, A5, A7) and the edge line exchanger of X*u*, et al. (Figure 1, X1, X3, and Y2) can be combined by including both in the same device and maintaining the connection between each internally. The motive to combine the packet exchanger and the edge line exchanger of X*u*, et al. is to allow for an integrated device that is smaller and cheaper to produce.

Regarding claim 18, *Xu* discloses a packet exchanger (Figure 1, Element A2 and Page 4) in an information transmission network system, having a plurality of line exchangers and, comprising a packet switch (Figure 1, Element A2) having a function for selecting communication lines used for transmittance, in accordance with packet-ingress-side's information transmitted by the communication lines and outputting (Pages 4-7). (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router via the communication lines [Page 5].)

Xu further discloses a plurality of *optical ingress routers* (Figure 1, Elements X1 and X2), for setting communication lines among the packet exchangers (Page 7, Section 8) comprising:

a. A section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining the communication lines for output (Page 7, Point 8, The ingress BAP speaker decides the next hop BGP speaker and initiates intra domain label switch path creation).

b. At least one section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, (Figure 1, Connection between X1 and X5) for exchanging connection information of the communication lines and acknowledging line connection condition in a communication network (Page 9, "In provider networks, both...." to end of page) wherein the section for controlling line paths have functions for transmitting messages to the line exchangers to

set up lines in accordance with the instructed paths so that the line exchangers receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths (Page 7, Section 8 – See (b), Supra). (Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, "In provider networks, both…." to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links [including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

c. A cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, (i.e. information received via IGPs) and connection information with respect to the packet exchange collected by the section for controlling packet paths, (i.e the BGP request from the packet router identifying the egress IP sought to be connected) selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths used for the new communication lines (Pages 7-8). (The provider ingress edge router has an intra-domain routing process that creates the intra domain label switched

path based on the interior optical network information [Page 7, Section 8] and the egress edge IP address [Page 7, Section 8]. Therefore, it is inherent that the instruction to create such a path must include the connection information of the line exchange and the packet path information.)

Xu fails to disclose a plurality of *packet exchangers* for setting communication lines among the packet exchangers comprising a section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining the communication lines for output, at least one section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection condition in a communication network wherein the section for controlling line paths have functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths and a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths used for the new communication lines. In the same field of endeavor, *Rajagoplan* discloses a

plurality of *packet exchangers* for setting communication lines among the packet exchangers comprising a section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining the communication lines for output, at least one section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection condition in a communication network wherein the section for controlling line paths have functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths and a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths used for the new communication lines (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing and link state information from the optical network and may also signal explicit routes through the network via the control domain [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally it is inherent that there exists cooperative control

between the IP [i.e. packet exchanger] and MPLS [i.e. path controller] signaling to establish the routes, as the routes are established responsive to demands to access remote IP networks, but are implemented using MPLS label switch establishment commands [Page 15-20, Section 6, Pages 13-14, Section 5.2].)

Therefore, since *Rajagoplan* suggests a combined IP router, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu*. Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* and implementing cooperative IP and MPLS control of routing, as taught in the separated packet and control units of *Xu* by means of BGP signaling (*Xu,* Page 6) and as taught by *Rajagoplan* via the combined IP/MPLS label path establishment. The motive to combine is provided by *Rajagoplan* and is to allow the IP network layer to use explicit route signaling if the IP network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Regarding claim 19, *Xu* discloses A packet exchanger (Figure 1, Element A2) in an information transmission network system, having a plurality of line exchangers (Figure 1, Elements X1 and X2) and a plurality of packet exchangers, (Figure 1, Elements A1 and A3) comprising:

a. Line switches, (Figure 1, Elements X5 and X2) connected to the line exchangers, having a function for connecting the communication lines arbitrarily (It is officially noted that optical cross connects contain line switches that can connect input and output ports arbitrarily).

b. A packet switch (Figure 1, Element A2) having function for selecting communication lines used for transmittance, in accordance with packet-ingress-side's information transmitted by the communication lines and outputting the same (Pages 4-7). (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router via the communication lines [Page 5].)

c. A section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining a communication line for output (Page 6). (The client side ingress edge router exchanges IP network reachability information with the provider side ingress edge router which forewords the information to the other client side ingress routers and vice versa [Page 6].)

Xu further discloses a plurality of *optical ingress routers* for setting communication lines among the packet exchangers comprising:

a. At least a section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection conditions in a communication network (Pages 7-8 and Page 9, "In provider networks, both…." to end of page). (Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, "In provider

networks, both…." to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links [including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

b. A cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, (i.e. internal intra-domain optical routing information) and connection information with respect to the packet exchange collected by the section for controlling packet paths, (i.e. the IP information of the exit edge router) selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so

that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths (Pages 4-8). (The provider ingress edge router has an intra-domain routing process that creates the intra domain label switched path based on the interior optical network information [Page 7, Section 8] and the egress edge IP address [Page 7, Section 8]. Therefore, it is inherent that the instruction to create such a path must include the connection information of the line exchange and the packet path information.)

Xu fails to disclose a plurality a packet/line exchanger in an information transmission network system, having a plurality of line exchangers and a plurality of packet exchangers, for setting communication lines among the packet exchangers, comprising at least a section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection conditions in a communication network a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up

the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths. In the same field of endeavor, *Rajagoplan* discloses a plurality a packet/line exchanger in an information transmission network system, having a plurality of line exchangers and a plurality of packet exchangers, for setting communication lines among the packet exchangers, comprising at least a section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection conditions in a communication network a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein the section for controlling line paths has functions for transmitting

messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing and link state information from the optical network and may also signal explicit routes through the network via the control domain [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally it is inherent that there exists cooperative control between the IP [i.e. packet exchanger] and MPLS [i.e. path controller] signaling to establish the routes, as the routes are established responsive to demands to access remote IP networks, but are implemented using MPLS label switch establishment commands [Page 15, Section 6, Pages 13-14, Section 5.2].)

Therefore, since *Rajagoplan* suggests a combined IP router, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu*. Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* and implementing cooperative IP and MPLS control of routing, as taught in the separated packet and control units of *Xu* by means of BGP signaling (*Xu,* Page 6) and as taught by *Rajagoplan* via the combined IP/MPLS label path establishment. The motive to combine is provided by *Rajagoplan* and is to allow the IP network to use explicit route signaling if the IP network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

8. **Claims 4-5** are rejected under 35 U.S.C. 103(a) as being unpatentable over X*u*, et al. (IETF Draft, June 2002, A BGP/GMPLS Solution for Inter-Domain Optical Networking) in view of *Rajagoplan* (Rajagoplan, Liciani, Aduche, Cain, Jamoussi and Saha, IP over Optical Networks: A Framework – Second Draft Version, 6 June 2002, Internet Engineering Task Force, Pages 1-41) as applied to claim 1 and further in view of *Jagannath* (US Patent No. 6,483,833 B1).

For Claim 4, X*u* discloses an optical edge router, (Figure 1, A2 and B2 and Page 5) used for an optical network, for transmitting packets between external IP networks and the optical edge router (Page 5, the Client Network B is an IP network and the Provider network A is an optical Network) and a program, used for optical networks and optical edge routers having se comprising:

a. A section for transmitting the packets between neighboring routers in neighboring external IP networks (Pages 5-6 - The IP Client Router A2 transmits packets to the Client A A3 IP router via the provider network).

b. A section for producing packet forwarding tables which set to where the packets are to be transmitted in the section for transmitting the packets (Page 6 – The different edge client edge routers learn the CAG routes and associated IP address via EGP. It is inherent that these routes are used to create a forwarding table, as the packets are switched according to the received routes.)

d. A section for exchanging route information between the neighboring routers (Page 6 – the edge router A2 uses traditional BGP to exchange routing information with neighboring routers.)

Xu further discloses an *optical ingress router* (i.e. a provider BNE – See Page 5, Figure 1, Element X1) comprising a section for signaling so as to establish/release optical paths, (Page 7, Step 8, The ingress BGP speaker [i.e. X1] uses an intra domain routing process to establish an intra domain optical circuit.) a section for notifying route information to other optical edge routers which face the optical edge router (Page 6, Section 4.1, Point 2 – BNEs disseminate CAGs via BGP to the other BNEs in the provider domain) and a section for collecting topology information existing in the optical network and storing the collected topology information in a storage section (Page 9 – The BNEs in the provider domain store link state information).

Xu fails to disclose an optical network wherein each of the *optical edge routers* comprises a section for signaling so as to establish/release optical paths and a section for collecting topology information existing in the optical network and storing the collected topology information in a storage section. In the same field of endeavor, *Rajagoplan* discloses an optical network wherein each of the *optical edge routers* comprises a section for signaling so as to establish/release optical paths and a section for collecting topology information existing in the optical network and storing the collected topology information in a storage section (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing information from the optical network and may also signal explicit routes through the network [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes.)

Therefore, since *Rajagoplan* suggests a combined IP router, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu*. Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan*. The motive to combine is provided by *Rajagoplan and* to allow the IP network to use explicit route signaling if the IP network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Xu fails to disclose an optical network wherein each of the *optical edge routers* comprises a section for notifying route information to other optical edge routers which face the optical edge router. In the same field of endeavor, *Rajagoplan* discloses an optical network wherein each of the *optical edge routers* comprises a section for notifying route information to other optical edge routers which face the optical edge router (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].)

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the

network should also be moved to the edge of the network along with the optical network control instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6). The motive to combine is to allow the dissemination of IP routes to other network domains.

Xu fails to disclose a router comprising a section for producing a routing table and storing the produced routing table in a storage section a section for reading out the routing table and the topology information from the storage section and producing packet forwarding tables which set to where the packets are to be transmitted in the section for transmitting the packets. In the same field of endeavor, *Jagannath* discloses a router comprising a section for producing a routing table and storing the produced routing table in a storage section a section for reading out the routing table and the topology information from the storage section and producing packet forwarding tables which set to where the packets are to be transmitted in the section for transmitting the packets (Column 4, Lines 50-67).

Therefore, since *Jagannath* discloses the use of a routing and label table, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the routing and label tables of *Jagannath* in the system of *Xu*. The routing and label tables of *Jagannath* can be combined with the system of *Xu* by implementing a routing table based on received routing information and implementing a label table based on the routing table and the allocated label switched paths as taught by *Jagannath*. The motive to combine is to allow the connection of specific IP addresses to labels.

For Claim 5, X*u* discloses a program, used for optical networks and optical edge routers (Figure 1, A2 and B2 and Page 5) having sections for predetermined calculations (Page 6 – It is inherent that the client edge routers calculate forwarding tables) and sections for transmitting packets between the section for predetermined calculations and external IP networks, (Pages 5-6 - The IP Client Router A2 transmits packets to the Client A A3 IP router via the provider network) wherein the section for the predetermined calculations comprises functions of producing a packet forwarding table which sets where the packets are to be transmitted to by the section for transmitting the packets (Page 6 – The different edge client edge routers learn the CAG routes and associated IP address via EGP. It is inherent that these routes are used to create a forwarding table, as the packets are switched according to the received routes.) and for exchanging route information between neighboring routers (Page 6 – the edge router A2 uses traditional BGP to exchange routing information with neighboring routers).

X*u* further discloses a program, used for optical networks and *optical ingress routers* [i.e. provider edge routers] having a section for predetermined calculations (Pages 5-6, The X1 optical edge router forwards frames, and therefore inherently have a calculated forwarding table, among other predetermined calculations) wherein the section for the predetermined calculations comprises functions of notifying route information to other optical edge routers which face the optical edge router, (Page 6, Section 4.1, Point 2 – BNEs disseminate CAGs via BGP to the other BNEs in the provider domain) collecting topology information inside the optical networks and storing the collected topology information in the storage section, (Page 9 – The BNEs in the provider domain exchange and store link state information) and signaling so as to establish/release the optical paths (Page 7, Step 8, The ingress BGP speaker [i.e. X1] uses an intra domain routing process to establish an intra domain optical circuit.)

Xu fails to disclose a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations comprises functions of collecting topology information inside the optical networks and storing the collected topology information in the storage section, and signaling so as to establish/release the optical paths. In the same field of endeavor, *Rajagoplan* discloses a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations comprises functions of collecting topology information inside the optical networks and storing the collected topology information in the storage section, and signaling so as to establish/release the optical paths (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing information from the optical network and may also signal explicit routes through the network [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes.)

Therefore, since *Rajagoplan* suggests a combined IP router, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan*. The motive to combine is provided by *Rajagoplan and* to allow the IP network to use explicit route signaling if the IP network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Xu fails to disclose a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations

comprises functions of notifying route information to other optical edge routers which face the optical edge router. In the same field of endeavor, *Rajagoplan* discloses a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations comprises functions of notifying route information to other optical edge routers which face the optical edge router (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].)

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the network should also be moved to the edge of the network along with the optical network control instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6). The motive to combine is to allow the dissemination of IP routes to other network domains.

Xu fails to disclose a program, used for optical networks and *optical edge routers* having a section for producing a routing table and storing the produced routing table in a storage section and reading out the routing tables and the topology information from the storage sections and producing a packet forwarding table which sets, e.g., where the packets are to be transmitted to by the section for transmitting the packets. In the same field of endeavor *Jagannath* discloses a program, used for optical networks and *optical edge routers* having a section for producing a routing table and storing the produced routing table in a storage section and reading out the routing tables and the topology information from the storage sections and producing a packet forwarding table which sets, e.g., where the packets are to be transmitted to by the section for transmitting the packets (Column 4, Lines 50-67).

Therefore, since *Jagannath* discloses the use of a routing and label table, it would have been obvious to a person of ordinary skill in the art to use the routing and label tables of *Jagannath* in the system of *Xu*. The routing and label tables of *Jagannath* can be combined with the system of *Xu* by implementing a routing table based on received routing information and implementing a label table based on the routing table and the allocated label switched paths as taught by *Jagannath*. The motive to combine is to allow the connection of specific IP addresses to labels.

9. **Claims 8, 11, and 14** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Rosen*, et al. (Rosen, Viswanathan and Callon, Multiprotocol Label Switching Architecture, Internet Engineering Task Force, July 2000) as applied to claims 6 and 12 and further in view of *Braun*, et al. (Braun, Guenter, and Khalil, Management of quality of service enabled VPNs, Communications Magazine, IEEE , vol.39, no.5, pp.90-98, May 2001).

Regarding claim 8, *Rosen* fails to disclose a cutting-through method wherein correspondence information with respect to the ingress-side IP address and its corresponding identifiers are exchanged among the edge routers by control signals. In the same field of endeavor, *Braun* discloses a cutting-through method wherein correspondence information with respect to the ingress-side IP address and its corresponding identifiers are exchanged among the edge routers by control signals (Page 92, “Multiprotocol Label Switching” - The labels and IP addresses associated with LSPs are exchanged between the edge routers.)

Therefore, since *Braun* discloses the use of label and IP distribution, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the label and IP distribution of *Braun* into the teachings of *Rosen*. The label and IP distribution of *Braun* can be implemented into the system of *Rosen* by distributing labels and associated IP information from the egress edge router to the ingress edge router as taught by *Braun*. The motive to combine is to allow the egress edge routers of *Rosen* to communicate network information concerning the established label paths, thereby allowing communication of reachability information between the edge rotuers.

Regarding claim 11, *Rosen* fails to disclose an edge router further comprising a section for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the section for maintaining the lists has a section for generating or updating the lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP addresses and the identifiers. In the same field of endeavor, *Braun* discloses an edge router further comprising a section for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the section for maintaining the lists has a section for generating or updating the

lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP addresses and the identifiers (Page 92, “Multiprotocol Label Switching” - The labels and IP addresses associated with LSPs are exchanged between the edge routers and the label paths are updated appropriately.)

Therefore, since *Braun* discloses the use of label and IP distribution, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the label and IP distribution of *Braun* into the teachings of *Rosen*. The label and IP distribution of *Braun* can be implemented into the system of *Rosen* by distributing labels and associated IP information from the egress edge router to the ingress edge router as taught by *Braun*. The motive to combine is to allow the egress edge routers of *Rosen* to communicate network information concerning the established label paths, thereby allowing communication of reachability information between the edge routers.

Regarding claim 14, *Rosen* fails to disclose a program according further comprising a function for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the function for maintaining the lists serves for generating or updating the lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP addresses and the identifiers. In the same field of endeavor, *Braun* discloses a program according further comprising a function for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the function for maintaining the lists serves for generating or updating the lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP addresses and the identifiers (Page 92, “Multiprotocol Label Switching” - The labels and IP addresses

associated with LSPs are exchanged between the edge routers and the label paths are updated appropriately.)

Therefore, since *Braun* discloses the use of label and IP distribution, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the label and IP distribution of *Braun* into the teachings of *Rosen*. The label and IP distribution of *Braun* can be implemented into the system of *Rosen* by distributing labels and associated IP information from the egress edge router to the ingress edge router as taught by *Braun*. The motive to combine is to allow the egress edge routers of *Rosen* to communicate network information concerning the established label paths, thereby allowing communication of reachability information between the edge routers.

Response to Arguments

10. Applicant's arguments filed 27 February 2009 have been fully considered but they are not persuasive.

Applicant's arguments that *Rosen*, et al. fails to disclose maintaining lists, in which ingress-side IP address correspond to identifiers for showing outgoing interfaces of egress edge routers, in ingress edge routers and adding the identifiers corresponding to the ingress-side IP address to the IP packets by the ingress edge routers when IP packets are transmitted have been considered and are not persuasive.

Rosen discloses the use of penultimate hop popping. In penultimate pop hopping terminating in an IP network, the final label switched router performs the functions of the egress edge router and acts as a bridge between the MPLS and IP network domains. That is, the final

label switched router/egress edge router receives an MPLS packet, uses the innermost/final MPLS label to determine the outgoing interface, pops the final label off the stack and transmits the packet as a network layer [i.e. IP] packet [Pages 19-20]. Therefore, applicants remarks that the label does not designate an output port on the “egress edge router” are not persuasive, as The Office maintains that the final label switched router (i.e. Optical Cross Connect, in the terminology of *Rosen*), not the border network element, functions as the egress edge router, as an optical edge router is "...for connecting an external IP network to the optical network..." (See Claim 1).

Applicant’s arguments that *Xu*, et al. and *Rajagopalan*, et al. fail to disclose that each optical edge router contains an optical network control instance for maintaining topology information in the optical network and switching/signaling the optical paths and an IP network instance for maintaining a routing table in each of the external IP networks and activating routing protocols between the external IP networks and the IP network instance have been considered and are not persuasive.

Xu discloses a system in which each of the optical edge routers has an a IP network instance for maintaining a routing table in each of the external IP networks and in which each optical ingress router has an optical network control instance for maintaining topology information in the optical network (See Claim 1, Supra). (The system of *Xu* discloses a set of customer edge based optical edge routers which maintain IP routing tables for connected edge networks and communicate with the customer network and other customer edge routers using BGP [Pages 5 and 7 – See Claim 1, Supra]. *Xu* further discloses a provider-side optical ingress router which stores status information for the internal optical network [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9 – See Claim 1, Supra].)

Therefore, what is lacking in the system of *Xu* is a system in which the functionality for maintaining topology information in the optical network and switching/signaling the optical paths resides in the customer edge router as opposed to the provider side optical ingress router. This missing link is provided by *Rajagopalan* which discloses a system wherein such functionality resides in the customer edge router (See Claim 1). Therefore, based on the disclosure of *Rajagopalan* a person of ordinary skill in the art at the time of the invention would have recognized that the optical functionality of the provider side optical ingress router of *Xu* could be moved from the provider side ingress router of *Xu* to the customer edge router of *Xu*. Such an observation is motivated by the desire to allow the customer to directly control the path through the optical network (See *Rajagopalan* Page 15, Section 6, Pages 13-14, Section 5).

Therefore, applicant's arguments that *Rajagopalan* discloses an integrated IP network, as opposed to the separated networks of the applicants invention, are moot since The Office relies on *Xu* to teach the use of separated networks. Arguments concerning the BGP distribution methods of *Rajagopalan* are likewise misdirected, as *Xu* is used to teach this aspect of the invention as well. It is noted that "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference.... Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art". See In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). See also In re Sneed, 710 F.2d 1544, 1550, 218 USPQ 385, 389 (Fed. Cir. 1983). In re Nievelt, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973).

Furthermore, since the system of *Xu* teaches a base device in which in which each of the optical edge routers has an a IP network instance for maintaining a routing table in each of the external IP networks and in which each optical ingress router has an optical network control instance for maintaining topology information in the optical network and *Rajagopalan* discloses

a comparable device (i.e. a customer edge router) that was improved in the same way (i.e. the customer edge router has a routing database of the internal optical network for directly signaling end-to-end connections) a person of ordinary skill in the art could have likewise applied the improvement to the base system of *Xu* by moving the optical routing functionality of *Xu* from the provider side ingress router to the customer edge router to obtain the predictable result of a customer edge router that stores both external IP network information and internal optical network information. See KSR International Co. v. Teleflex Inc. (KSR), 550 U.S. 398, 82 USPQ2d 1385, 1395-96 (2007).

Applicant's arguments that *Xu*, et al., *Rajagopalan*, et al. and *Jagannath*, et al. fail to disclose a system which supports multiple IP networks have been fully considered and are not persuasive.

Xu discloses a system that supports multiple IP networks in a MPLS using BGP updates by maintaining a router section for each external IP network which routes packets to appropriate destinations based on received routing information (See Claim 4, Supra). *Jagannath* discloses using BGP updates to distribute routing information in a MPLS network and the use of topology databases and routing lookups such that the system reads out the routing tables and the topology information from the storage sections and producing a packet forwarding table which sets, where the packets are to be transmitted to by the section for transmitting the packets (Column 4, Lines 50-67 – See Also Claim 4, Supra). Therefore, a person of ordinary skill in the art would have recognized that the topology storage and generation of *Jagannath* could be implemented in the routers of *Xu*, the motive being to allow the routers to send and receive routing updates and act based on those updates.

Therefore, *Jagannath* is not relied upon to teach the existence of multiple external IP networks or multiple network instances, only the use of BGP to exchange MPLS information and

techniques for storing and updating routing tables. Therefore, arguments that *Jagannath*, et al. fails to disclose a system which supports multiple IP networks are not persuasive, although correct, are not persuasive, as these features are found in *Xu* and *Rajagopalan*.

Applicant's arguments that *Braun* fails to disclose a method wherein correspondence information with respect to the ingress-side IP address and its corresponding identifiers are exchanged among the edge routers by control signals have been considered and are not persuasive. *Braun* discloses exchanging correspondence info a method wherein correspondence information with respect to the ingress-side IP address and its corresponding identifiers are exchanged among the edge routers by control signals (Page 92, "Multiprotocol Label Switching"). This disclosure is both sufficient and relevant.

Finally, applicant's arguments that the specificity of the exchanged identifiers is insufficient have been considered and are not persuasive, as the system of *Rosen* teaches the use of labels of sufficient specificity and *Braun* is not relied upon to teach this aspect of the invention.

Conclusion

11. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

a. *Ould-Brahim*, et al. (H. Ould-Brahim, Y. Rekhter, D. Fedyk, E. Rosen, E. Mannie, L. Fang, J. Drake, Y. Xue, R. Hartani and D. Papadimitrio, BGP/GMPLS Optical/TDM VPNs, IETF Draft, November 2001, Pages 1-18) – Disclosing an Optical VPN using MPLS in which the Provider edge router maintains separate routing instances for each of

the customer VPNs and communicates with each customer VPN using BGP to distribute routes for all endpoints in a VPN (Pages 6-9, Section 3). *Ould-Brahim* further discloses that each label switched path (i.e. identifier) may be associated with a specific outgoing port of the provider edge router (Pages 6-7), that the provider edge router participates in the GMPLS signaling in the internal optical network and that the internal addressing of the optical network is separate and distinct from the customer VPN address space (Pages 6-9, Section 3). See also Related Patent Applications, US Pre Grant Publication Numbers 2003/0147402 and 2004/0049597.

b. Wang, et al. (D. Wang, J. Strand, G. Li, J. Yates, C. Kalmanek, G. Li and A. Greenberg, OSPF for Routing Information Exchange across Metro/Core Networks, 4 December 2001, Pages 1-12) - Disclosing a system that maintains both intra and inter domain routing tables at each edge router (Page 4) and which routes flows to the output ports of an egress edge router (Page 5, Section 3.1).

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Crutchfield whose telephone number is (571) 270-3989. The examiner can normally be reached on Monday through Friday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Ryman can be reached on (571) 272-3152. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Christopher Crutchfield/
Examiner, Art Unit 2419
6/16/209

/Daniel J. Ryman/
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